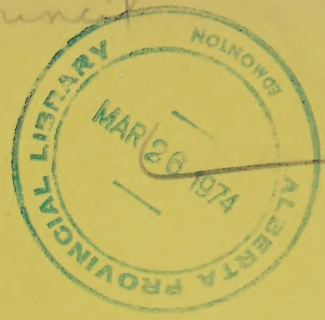


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EVALUATION OF TEST ACHIEVEMENT
for the
PRESCHOOL PROJECT
A Technical Report
for the
Human Resources Research Council



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EVALUATION OF TEST ACHIEVEMENT

for the
PRESCHOOL PROJECT

A Technical Report
for the

Human Resources Research Council

Prepared by

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Education Consultant

July, 1972

Forward and Acknowledgements

The Technical Report on the Evaluation of Test Achievement for the Early Childhood Education Evaluation is one part of a series of reports undertaken by the Alberta Human Resources Research Council under contract with the Government of Alberta. The primary purpose is to evaluate the changes in intellectual ability and cognitive achievement.

The author acknowledges the development of the research design, selection of instruments and compilation of data provided by the Project Director, Dr. H.N. Watts, the Project Administrator, R. Pacey and their instructional and testing research assistants. In addition, the assistance and advice of Elizabeth McBride and Alice Gable, and the stenographic assistance of staff members of H.R.R.C. are appreciated. Technical advice and data processing were provided under the direction of Dr. J. Reid and D. Fehlberg of the Division of Operational Research, Department of Education, Government of Alberta.

Deficiencies, errors, and propriety of judgments and inferred generalizations remain the responsibility of the undersigned.

N.J. Chamchuk

22 August 1972

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HUMAN RESOURCES RESEARCH COUNCIL
PRESCHOOL PROJECT EVALUATION
CHILDREN'S DEVELOPMENT TESTING

Introduction

Plans of the Alberta Human Resources Research Council for the Early Childhood Education Evaluation were formulated in a manner intending review of antecedents, transactions, and outcomes of the pilot projects. Of the eleven objectives to be reviewed, one related to gains in cognitive areas (Watts, 1971: 21). Specifically, two parts of Objective F stated:

1. Do the children make gains in general intellectual development?
3. Do the children make gains in their ability to communicate?

As part of the evaluation of the preschool projects in Edmonton and Calgary, a variety of tests were administered to children, and analyses made of the test results. This report reviews the nature and extent of testing, and the analysis and interpretation of test results.

Testing was performed by individuals (in Edmonton) or groups (RESCON in Calgary) under contract to HRRC, with pretesting performed in October-November 1971 and post-testing completed in May-June 1972, an interval of approximately six months.

The Children Tested

The children who were tested represented three groups:

1. The Edmonton group consisted of 136 children in half-day preschool programs in the mornings or afternoons at Delton, Oliver, and North Edmonton school attendance areas and operated by the public school authorities under contract with the Government of Alberta..
2. The Calgary group consisted of 30 children who participated in the mornings-only preschool operated by Educorps for the Inglewood Community Association under contract with the Government of Alberta.
3. A "Control" group of 25 children who were not participating in any form of organized preschool programs was identified from the same geographic areas of Edmonton as those attending the school system program.

Test scores were obtained for pretests and post-tests for a sample of Edmonton program children, for all Calgary program children, and for all Edmonton Control group children. Because of mobility and withdrawal from programs, the actual numbers tested were greater than those for whom complete sets of results were available for analysis. Summary tables indicate the number of scores (n) used for statistical comparisons.

The Tests

The same form of three tests were administered to obtain pre-test and post-test scores:

1. Peabody Picture Vocabulary Test (PPVT) (American Guidance Service: 1959);
2. Illinois Test of Psycholinguistic Abilities (ITPA) (University of Illinois: 1968 - six selected subtests were administered); and
3. Caldwell Preschool Inventory (CPI) (Cooperative Testing Service: 1967).

In addition, a number of items of demographic data were obtained from a questionnaire of child and family information.

Peabody Picture Vocabulary Test (PPVT). The test has been widely used as an "intelligence" test although it is basically a test of vocabulary. The child is shown four pictures, the examiner says a word, and asks the child to point to the correct picture. A ceiling score is established when the child makes six errors out of eight consecutive responses. Mental age equivalents based on a sample of Tennessee children are available. (Cazden, 1971:390)

The test has been assessed as highly dependent on the child's verbal ability; however, the nonverbal response (pointing) may be easily influenced by the examiner's bias and resulting cues (Hines, 1971:2).

The advantages of easy administration, reliability, and high correlation with other more time consuming instruments have been seen as outweighing other considerations and justifying its use in this series of measures.

Illinois Test of Psycholinguistic Abilities (ITPA). According to the authors, the purpose of the test is:

To relate those functions whereby the intentions of one individual are transmitted (verbally or nonverbally) to another individual, and, reciprocally, functions whereby the environment or the intentions of another individual are received and interpreted. It attempts to interrelate the processes which take place, for example, when one person receives a message, interprets it, or becomes a source of a new signal to be transmitted. It deals with the psychological functions of the individual which operate in communication activities.

The ITPA consists of ten somewhat overlapping subtests, six of which were used for the program measures, and are described in the following details.

ITPA Subtest 1, Auditory Reception

Auditory reception measures the ability of a child to derive meaning from verbally presented material. Since the receptive rather than the expressive process is being sampled, the response throughout is kept at the simple level of a "yes" or "no" or even a nod or shake of the head. The vocabulary becomes more and more difficult while the response remains at a two-year level. Similarly, the automatic function of determining meaning from syntax has been minimized by retaining only one sentence form. The test contains 50 short, direct questions printed in the manual. Typical items are: "Do dogs eat?" "Do dials yawn?" "Do carpenters kneel?" "Do wingless birds soar?"

It seems likely that this subtest measures functions more complex than the ability to hear and understand simple questions. At the very least it is responsive to the vocabulary level of the individual, especially in the area of noun-verb relationships.

ITPA Subtest 2, Auditory-Vocal Association

This measure taps the child's ability to relate concepts presented orally. In this test the requirements of the auditory receptive process and the vocal expressive process are minimal, while the organizing process of manipulating linguistic symbols in a meaningful way is tested by verbal analogies of increasing difficulty. A sentence completion technique is used, presenting one statement followed by an incomplete analogous statement, and allowing the child to complete the second statement, appropriately. There are 42 orally presented analogies, such as, "I cut with a saw; I pound with a ____." "A dog has hair; a fish has ____."

Subtest 2 probably is an overall measure of the child's ability to reason by analogies, as well as his general knowledge of objects and their functions in the environment.

ITPA Subtest 3 (Auditory Sequential Memory)

The purpose of this test is to assess the child's ability to reproduce from memory sequences of digits increasing in length from two to eight digits. The test differs from the digit repetition task of the Stanford-Binet or the WISC in that the digits are presented at the rate of two per second instead of one per second and in that the child is allowed a second trial of each sequence if he fails on the first presentation. He receives more credit for a success on the first than on the second trial. A more rapid presentation makes the task easier, which is necessary for the two and the three year old children.

ITPA Subtest 4 (Verbal Expression)

The purpose of this test is to assess the ability of the child to express his own concepts vocally. The child is shown four familiar objects one at a time (ball, block, envelope, and a button) and is asked, "Tell me all about this." The score is the number of discrete, relevant, and approximately factual concepts expressed.

This subtest undoubtedly reflects several factors other than verbal ability. The rapport with the examiner, the child's motivational level; and the amount of his previous experience with the objects are all highly important in the quantity of verbal response.

ITPA Subtest 5 (Grammatical Closure)

This subtest assesses the child's ability to make use of the redundancies of oral language in acquiring automatic habits for handling syntax and grammatical inflections. In this test the conceptual difficulty is low, but the task elicits the child's ability to respond automatically to often repeated verbal expressions of standard American speech. The child comes to expect or predict grammatical form so that when part of an expression is presented he closes the gap by supplying the missing parts. The test measures the form rather than the content of the missing word, since the content is provided by the examiner.

There are 33 orally presented items accompanied by pictures which portray the content of the verbal expression. The pictures are included to avoid contaminating the test with difficulty in the receptive process. Each verbal item consists of a complete statement followed by an incomplete statement to be finished by the child. The examiner points to the appropriate picture as he reads the given statements; for example: "Here is a dog; here are ____."

Essentially, Subtest 5 measures the ability to follow the conventional rules of grammar and make single-plural and possessive transformations.

ITPA Subtest 6 (Manual Expression)

Subtest 6 taps the child's ability to express ideas manually. This ability is assessed by gestural manipulation tests. In this test fifteen pictures of common objects are shown to the child one at a time and he is asked, "Show me what to do with a ____." The child is required to pantomime the appropriate action, such as dialing a telephone or playing a guitar.

This subtest presumes acquaintance with the object shown to the child, and thus becomes a measure of vocabulary, as well as the ability to communicate nonverbally.

Although the test was originally designed for diagnosing language disabilities, it has been included because more appropriate tests were not available.

The Caldwell Preschool Inventory (CPI)

The Preschool Inventory is an assessment procedure developed in the mid-1960's to facilitate measurement of cultural disadvantage or deprivation for participants in the Head Start program in the United States. It is administered individually to the child and has been analyzed as representing four factors:

One factor has been called personal-social responsiveness (PSR) involving the child's knowledge of his personal world (name, address, parts of body, friends) and his ability to carry out verbal instructions (bodily movement and ordering of objects) given by an adult.

The second factor, associative vocabulary (AV) requires the child's demonstration of his connotation of words related to directions of motion (elevators, saws, records, waterfalls, etc.), related to time (seasons, meals, etc.) and places (zoo, stores, library, etc.). The third factor relates to numerical concepts (CN) of questions of how many, more or less, serial position. The fourth factor relates to sensory concepts (CS) of shape, color, spatial configuration.

The test has been described as heavily verbal with half verbal and half motoric responses, and with several items involving obeying commands. (Kamii, 1971:339)

Data Processing

Raw scores were used to perform an analysis of covariance on the post-test scores using chronological age and PPVT pretest scores as covariates. The effect of this procedure was to adjust means of post-test scores to compensate for initial variation in chronological age and intellectual ability as measured by the PPVT pretest. Computer processing was completed under the direction of Mr. D. Fehlberg of the Division of Operational Research, Department of Education. The general procedure was to compute the probability of statistically significant differences for the over-all groups with post-hoc comparisons being made between selected groups where over-all F-values were significant (Hays, 1963: 486-487). Post-hoc tests used the procedure attributed to Scheffe for the test of the difference between two adjusted means at the .05 level. (Winer, 1962:585).

Summary of the Findings

A summary of probability levels associated with statistical support of rejection of null hypothesis (in the classic experimental design sense) is provided in Table 1. Null hypotheses have not been

verbalized for this report but may be phrased by the erudite reader.¹

For the experimental-control (ITPA) comparison, the analysis of covariance (ANCOVA) used scores for three groups of up to 33 Edmonton children, up to 27 Calgary children, and up to 25 Control children. Where complete data were not available, the n's became 20, 23, and 11. Since post-test scores for the CPI for Calgary children were not available in time for processing, comparisons were made between 119 Edmonton children and 25 Control children.

A second set of analyses were performed using sex, age, number of siblings, television watching of Sesame Street, number of parents providing domestic care, employment of parents, income levels of parents and parental involvement at classes as criterion variables to explore differences within groups and are reported in detail later. The number of scores for some groups were as low as 4.

¹ H_0 take the general form: (Statistically) there are no significant differences among the mean scores on the post-test of the groups for (test).

TABLE 1

PROBABILITY VALUES FROM ANCOVA OVER-ALL TESTS OF GROUP SCORES¹

Test ITPA	Subtest					
	AR	AA	AM	VE	GC	ME
p =	0.436	0.000	0.544	0.013	0.116	0.004
CPI	PSR	AV	CN	CS	TOTAL	
p =	0.005	0.000	0.001	0.292	0.000	

¹Groups were Edmonton, Calgary, and Control

Note: Subsequent comparisons between Edmonton-Control and Calgary-Control means revealed no significant differences

Edmonton, Calgary, and Control Group Comparisons

ITPA

From Table 1, comparing scores for Edmonton, Calgary, and Control groups on the ITPA significant values for the over-all F-test appeared for the auditory association (AA), verbal expression (VE) and manual expression subtests, but not for auditory recognition (AR), auditory sequential memory (AM) nor grammatical closure (GC). However, subsequent analyses indicated that the differences between Edmonton-Control and Calgary-Control groups were not significant at or beyond the .05 level. Further information is provided by the summary of means and age-equivalents in Table 2.

TABLE 2

TREATMENT-CONTROL COMPARISONS OF MEANS AND AGE-EQUIVALENTS
for the ITPA SUBTESTS

Subtest	Group (n)	Pre X ₁	Post X ₂	Post-Adj. X _{2a}	Gains (Mo.)
A.R.	Ed. (33)	18.52 (4-11) ¹	22.00 (5-06)	21.94 (5-06)	7
	Cal. (27)	17.56 (4-08)	20.52 (5-03)	21.19 (5-04)	6
	Con. (25)	19.28 (4-10)	20.72 (5-03)	20.08 (5-02)	4
A.A.	Ed. (20)	16.30 (5-01)	21.90 (6-02)	21.85 (6-02)	13
	Cal. (23)	16.04 (5-01)	18.17 (5-05)	18.33 (5-05)	4
	Con. (11)	16.55 (5-02)	20.09 (5-09)	19.84 (5-09)	7
A.M.	Ed. (33)	17.94 (5-00)	21.82 (5-11)	21.62 (5-11)	11
	Cal. (27)	16.04 (4-08)	19.30 (5-04)	20.72 (5-08)	12
	Con. (25)	19.20 (5-04)	21.80 (5-11)	20.53 (5-08)	4
V.E.	Ed. (33)	12.36 (4-07)	16.42 (5-03)	17.39 (5-05)	10
	Cal. (27)	16.15 (5-02)	18.11 (5-06)	16.53 (5-03)	1
	Con. (25)	13.16 (4-08)	13.64 (4-10)	14.07 (4-10)	2
G.C.	Ed. (33)	13.30 (5-05)	16.73 (5-11)	16.53 (5-11)	6
	Cal. (27)	11.44 (5-01)	13.70 (5-05)	14.85 (5-08)	7
	Con. (25)	14.40 (5-07)	16.20 (5-10)	15.21 (5-08)	1
M.E.	Ed. (33)	18.21 (5-04)	22.21 (6-06)	22.95 (6-09)	17
	Cal. (27)	20.85 (6-00)	22.85 (6-08)	22.27 (6-06)	6
	Con. (25)	20.40 (5-11)	19.64 (5-08)	19.29 (5-07)	-4

¹Age-equivalents related by the test manual

From Table 2 it becomes evident that actual gains in test achievement were not generally large. Six months of reported gains should have been expected due to the increased age of children between pretest and post-test. Additional gains should have been expected because of test familiarity, and test experience (the same form of the

test was used both times). No attempt is made to account for frequent reported gains of less than 8 months, nor for the apparent loss on the Manual Expression subtest by the Control group. Inspection of the raw data indicated that ranges of age-equivalents from three years to ten years were common on the pretest. Individual gains were similarly wide in range, with gains from 4 years to "losses" of 4 years for some individual children on some subtests.

TABLE 3

TREATMENT-CONTROL COMPARISONS OF MEANS FOR THE CPI SUBTESTS

Subtest	Group (n)	Pre X ₁	Post X ₂	Post-Adj. X _{2a}	Gains
P.S.R. p=0.005	Ed. (119)	19.38	22.08	22.21	2.83
	Cal. (29)	20.13	22.41	n.i. ¹	2.28
	Con. (25)	22.08	20.72	20.12	-1.96
A.V. p=0.000	Ed. (119)	14.28	17.78	17.82	3.54
	Cal. (29)	16.16	19.59	n.i.	3.43
	Con. (25)	14.60	14.20	14.03	-0.57
C.N. p=0.001	Ed. (119)	11.97	14.63	14.77	2.80
	Cal. (29)	12.10	15.74	n.i.	3.64
	Con. (25)	13.40	13.48	12.79	-0.61
C.S. p=0.292	Ed. (119)	15.32	17.29	17.34	2.02
	Cal. (29)	16.26	17.72	n.i.	1.46
	Con. (25)	15.92	16.96	16.75	.83
TOTAL p=0.000	Ed. (119)	60.97	71.79	72.21	11.24
	Cal. (29)	64.65	75.45	n.i.	10.80
	Con. (25)	64.56	65.56	63.57	0.99

¹Calgary scores were not available in time for processing by ANCOVA; means were subsequently computed and reported for information only. Probabilities (p) are reported for statistical comparisons between Edmonton and Control groups.

CPI

Table 3 provides a summary of comparisons for the CPI subtests scores.

From Table 3, significant differences between Edmonton and Control groups existed for three of the subtests - personal-social responsiveness, associative vocabulary, and numerical concepts - as well as for total raw scores, but not for sensory concepts. Inspection of the means indicates that Edmonton showed gains of two to four points on subtests while scores for the Control group were generally lower than on their pretest - even though the children were six months older and were repeating their previous test experience. No attempt is made to account for the apparent loss in Control achievement.

Mean scores for the Calgary group were generally higher than those of the Edmonton group both on pretest and post-test.

Other Criterion Comparisons

In addition to comparison of post-test results between treatment and control groups, a number of analyses were performed to compare the results when children were grouped according to other criteria.

Sex

One criterion for analysis was sex of children. Male scores were compared with female. The results are reported in Table 4.

There were no significant differences between the adjusted means for Edmonton boys versus Edmonton girls. Neither did any clear pattern of differences in gain appear.

TABLE 4

SUMMARY OF EDMONTON CPI SCORES
GROUPED ACCORDING TO SEX OF CHILDREN

Subtest	Sex (n)	Pre X ₁	Post X ₂	Post-Adj. X _{2a}	Gain X _{2a} -X ₁
P.S.R.	M(50)	19.0	22.3	22.8	3.8
	F(41)	20.4	23.1	22.7	2.3
A.V.	M(as above)	14.5	18.1	18.2	3.6
	F	14.3	18.3	18.4	4.1
C.N.	M	12.2	15.3	15.4	3.2
	F	11.9	14.8	15.0	3.1
C.S.	M	15.1	17.5	17.7	2.6
	F	16.0	17.8	17.6	1.6
TOTAL	M	60.8	73.2	74.1	13.3
	F	62.6	74.0	73.7	11.1
M = male F = female					

Age

For the age criterion the scores of children who were under five years of age at pretest time were compared to those children who were five years and six months or older. The results of CPI scores are reported in Table 5. Observation of the means and gains indicates that scores of those under 5 were generally lower on pretests, and although the net (unadjusted) gains were higher for those under 5, the post-test scores were still lower in each case than for the over 5 years 6 months group. Comparison of the means indicated no significant differences.

TABLE 5

SUMMARY OF EDMONTON CPI SCORES
GROUPED ACCORDING TO AGE OF CHILDREN

Subtest	Age (n)	Pre X_1	Post X_2	Post-Adj. X_{2a}	Gain $X_2 - X_1$
P.S.R.	U(31)	18.1	21.9	22.7	3.7
	O(23)	20.8	23.6	22.9	2.2
A.V.	U(as above)	13.3	17.5	18.1	4.2
	O	15.3	18.4	17.9	3.1
C.N.	U	11.3	14.2	14.8	3.0
	O	12.8	15.3	15.1	2.5
C.S.	U	14.1	17.1	17.6	3.0
	O	16.6	18.3	17.8	1.7
TOTAL	U	56.8	70.7	73.8	13.9
	O	65.4	75.5	73.2	10.1
U < 5 years					
O <u>></u> 5 years 6 months					

Siblings

The third criterion for within group comparison was the number of siblings in the family. Children were grouped into those who had 1 - 2 siblings and those who had 3 or more. The results are summarized in Table 6.

Comparison of the means for Edmonton children indicated that those with fewer than three siblings had higher scores on the pretest but the marginal differences tended to be eliminated on the post-test. Comparison of the adjusted means between Edmonton children with fewer

than three siblings and Edmonton children with three or more siblings indicated no significant differences.

TABLE 6

SUMMARY OF EDMONTON CPI SCORES
GROUPED ACCORDING TO NUMBER OF SIBLINGS

Subtest	Number (n)	Pre X_1	Post X_2	Post-Adj. X_{2a}	Gain $X_{2a}-X_1$
P.S.R.	L(49)	19.9	23.0	22.9	3.0
	G(42)	19.2	22.2	22.6	3.4
A.V.	L(as above)	15.0	18.2	17.8	2.8
	G	13.7	18.2	18.8	5.1
C.N.	L	12.2	15.3	15.4	3.2
	G	11.9	14.8	15.0	3.1
C.S.	L	16.0	17.8	17.6	1.6
	G	14.9	17.4	17.7	2.8
TOTAL	L	63.2	74.2	73.5	10.3
	G	59.8	72.7	74.4	14.6
L = fewer than three siblings G = three or more siblings					

Television Viewing Habits

The Child and Family Questionnaire contained an item which requested indications of the frequency with which the child viewed selected children's television programs - Sesame Street, Chez Helene, Friendly Giant, and Mr Dressup. The scores of those viewing Sesame Street three or more times per week were compared to those of children who

viewed Sesame Street less frequently. The summary is provided in Table 7.

Comparison of the means of scores of Edmonton watchers with non-watchers revealed no significant differences.

TABLE 7

SUMMARY OF EDMONTON CPI SCORES
GROUPED ACCORDING TO TELEVISION WATCHING HABITS

Subtest	Group(n)	Pre X_1	Post X_2	Post-Adj. X_{2a}	Gain $X_{2a}-X_1$
P.S.R	W(80)	19.7	22.7	22.7	3.0
	N(11)	19.0	22.1	22.6	3.6
A.V.	W(as above)	14.4	18.3	18.4	4.0
	N	14.6	17.1	17.0	2.4
C.N.	W	12.1	15.1	15.2	3.1
	N	11.5	14.9	15.4	3.9
C.S.	W	15.6	17.6	17.6	2.0
	N	14.9	17.5	17.8	2.9
TOTAL	W	61.8	73.8	74.0	13.2
	N	60.1	71.6	73.1	13.0
W = reported watching Sesame Street at least three times per week N = others					

Number of Parents

The fifth comparison was made between the scores of those children who were currently in the care of single parents with those reporting the presence of both parents. The summary is provided in Table 8. Comparison of the means revealed no significant differences.

TABLE 8

SUMMARY OF CPI SCORES ACCORDING TO NUMBER OF PARENTS PROVIDING DOMESTIC CARE

Subtest	Number (n)	Pre X ₁	Post X ₂	Post-Adj. X _{2a}	Gain X _{2a} -X ₁
P.S.R.	2 (77)	19.8	22.7	22.7	2.9
	1 (14)	18.5	22.1	23.0	4.5
A.V.	2 (as above)	14.5	18.2	18.2	3.7
	1	13.8	18.2	18.7	4.9
C.N.	2	12.0	15.1	15.2	3.2
	1	12.4	15.1	15.0	2.6
C.S.	2	15.6	17.6	17.6	2.0
	1	14.7	17.6	18.0	3.3
TOTAL	2	62.0	73.6	73.7	11.7
	1	59.4	73.1	75.0	14.6
Note: 2 = both parents at home 1 = single parent families					

Employment of Parents

The sixth comparison was made between the Edmonton group which reported both parents with (remunerative) jobs and those with one parent providing full-time domestic care. The results are summarized in Table 9

The pretest scores of children with both parents working were slightly higher than those with only one parent working, but adjusted gains of the latter were slightly higher in turn. Comparison of adjusted means between the two groups revealed no significant differences.

TABLE 9
SUMMARY OF CPI SCORES GROUPED ACCORDING
TO NUMBER OF PARENTS REMUNERATIVELY EMPLOYED

Score	Number (n)	Pre X ₁	Post X ₂	Post-Adj. X _{2a}	Gain X _{2a} -X ₁
P.S.R	O (67)	19.4	22.4	22.6	3.2
	B (22)	20.1	23.2	23.0	2.9
A.V.	O (as above)	13.9	17.9	18.3	4.4
	B	15.8	18.5	17.7	1.9
C.N.	O	11.8	14.9	15.2	3.4
	B	12.6	15.2	15.0	2.4
C.S.	O	15.2	17.6	17.7	2.5
	B	16.0	17.6	17.4	1.4
TOTAL	O	50.4	72.8	74.0	23.6
	B	64.5	74.6	72.9	8.4
O = one parent employed B = both parents employed					

Level of Parental Income

The seventh comparison grouped those children whose parental incomes were below \$5000 and those children whose parental incomes were above \$7000. Examination of pretest means reveals that those whose parents had higher incomes regularly scored higher. While the same relationship still was true for post-test scores, the marginal differences were decreased. Comparison between adjusted means of the two groups revealed no significant differences.

TABLE 10

SUMMARY OF CPI SCORES GROUPED ACCORDING TO LEVEL OF PARENTAL INCOME

Subtest	Level (n)	Pre X ₁	Post X ₂	Post-Adj. X _{2a}	Gain X _{2a} -X ₁
P.S.R.	U (18)	17.3	21.0	22.6	5.3
	O (54)	20.4	23.2	22.9	2.5
A.V.	U (as above)	11.1	16.1	18.2	7.1
	O	15.3	18.8	18.2	2.9
C.N.	U	10.7	13.8	14.9	4.2
	O	12.9	15.8	15.6	2.7
C.S.	U	13.6	16.9	17.9	4.3
	O	16.3	18.0	17.7	1.4
TOTAL	U	52.8	67.9	74.7	21.9
	O	65.0	75.8	74.1	9.1
U = under \$5000 O = over \$7000					

Parent Involvement

The eighth and final comparison was made between those children who had one or more parents acting as helpers to the instructor one or more times and those children whose parents were never directly involved in such assistance. The results are summarized in Table 11. No clear pattern of differences were observable from inspection of the means and gains, and analysis indicated no significant differences.

TABLE 11

SUMMARY OF CPI SCORES GROUPED ACCORDING OF PARENTAL INVOLVEMENT

Subtest	Level (n)	Pre X ₁	Post X ₂	Post-Adj. X _{2a}	Gain X _{2a} -X ₁
P.S.R.	N (35)	18.9	21.9	22.3	3.2
	H (56)	20.0	23.0	22.8	2.8
A.V.	N (as above)	13.8	17.9	18.3	4.5
	H	14.8	18.4	18.1	3.3
C.N.	N	11.1	14.6	15.1	4.0
	H	12.7	15.4	15.0	2.3
C.S	N	15.1	17.3	17.5	2.4
	H	15.7	17.8	17.7	2.0
TOTAL	N	59.0	71.8	73.5	14.5
	H	63.2	74.6	73.5	10.3
N = not helping H = helping					

AGE-NORM COMPARISONS

An alternative to the previous statistical analysis of test scores may be to use marginal gains in achievement as program performance indicators. Specifically, in terms of norms for age-equivalents of raw scores, how much did the children gain beyond what may have been expected?

PPVT

One analysis was performed on the PPVT. The distribution of gains (or losses) is summarized in Table 12. For the Control group, changes ranged from a loss of 5 months to a gain of 25 months, with the average recorded gain at 9.6 months. The Calgary and Edmonton distributions were similar with average gains of 12.2 and 12.6 months respectively.

If a child's age at time of pretest was 5 years 7 months and recorded an average score, the net effect of a gain of the equivalent of 12 months in achievement over the six-month time interval could be calculated as increasing the "intelligence quotient" from 100 to 112. However, it should be noted that even without formal program experience the Control group gains were nearly as great.

Since scores on the PPVT were used as the covariate for statistical analysis of ITPA and CPI, it may well be true that differences which would have appeared under other circumstances have been reduced by the regression effects so that they are no longer significant.

TABLE 12

AGE-EQUIVALENT GAINS (OR LOSSES) ON PPVT

	Gains in Months						n
	0-8	9-12	13-16	17-20	21-24	25+	
Control X = 9.6	7 (2)	6	2	6	1	1	23 2
Edmonton X=12.4	7 (1)	3	12	3	5	2	32 1
Calgary X=12.2	7 (2)	3	7	5	1	2	25 2

ITPA

Since age-equivalent norms were available for the ITPA, average gains and ranges were calculated and are summarized in Table 13. From examination of the table a clear pattern of change is difficult to identify. Assuming that six to eight months of gain should be attributed to maturity (6 months) and test familiarity, there are few instances of appreciable gain as measured by the ITPA.

CPI

Similar transformations were not available for the CPI.

TABLE 13

AVERAGE GAINS (MONTH-EQUIVALENTS) AND RANGES FOR ITPA

Subtest	Group		
	Control	Calgary	Edmonton
A.R.	1.3	6.6	6.3
A.A.	6.4	4.4	9.9
A.M.	7.2	9.6	8.7
V.E.	0.8	3.8	6.6
G.C.	4.8	3.9	8.2
M.E.	-4.3	9.9	14.6

PERFORMANCE CONTRACTING COMPARISON

One additional analysis of achievement was made according to the following basis:

1. An objective of the program is readiness for regular school.
2. The minimum age for school beginners in Alberta is 5 years 6 months.
3. Those whose intellectual-age equivalents were less than 5 Years at pretest time would not likely reach an age of 5 years 6 months at post-test time without compensatory assistance.
4. Those who met the conditions of the previous item but did not reach 5 years and 6 months at post-test time would be considered as not ready for beginning school.

Using the PPVT scores as a measure of performance, the results as summarized below:

	Less than 5-00 at pretest	Still less than 5-06 at post test
Calgary	13	6
Edmonton	16	8
Control	13	7

It would appear that of those children who would not likely be ready for Grade One the following September, approximately half would still not be ready after the program was experienced. Further, the proportions are similar for children who are not enrolled in programs. This analysis seems to suggest that the programs were only moderately successful in being compensatory to those of lower levels of intellectual achievement.

SUMMARY

The analyses of scores of the Edmonton, Calgary, and Control groups revealed significant differences between the Edmonton-Control means on the subtests and total for the Caldwell Preschool Inventory. There was no clear pattern of differences on the subtests of the Illinois Test of Psycholinguistic Abilities between Edmonton-Control and Calgary-Control comparisons.

Normative non-treatment gains on the ITPA (anticipated at eight months due to the six-month maturation and test familiarity effects) were not generally achieved by either the treatment or control groups. The validity of the ITPA as a preschool achievement test seems questionable. Normative transformations for CPI data were not available. However, Control scores were generally lower on the post-test than on the pretest, and likely have contributed appreciably to the finding of significant differences for the treatment groups.

Calgary CPI scores were not analyzed, but inspection of mean scores and gains seem to indicate gains comparable to those of the Edmonton group and significant differences with the Control group.

Subsequent analyses within the Edmonton group revealed no significant differences related to the sex, age, number of siblings, television-watching habits, parental care, parental employment, parental income levels, nor direct parental involvement.

The CPI appears to discriminate between preschool-experienced and non-experienced children.

Mean net gains of 2 - 4 points on subtests of 19 - 26 points were sufficient to generate significant statistical differences on the CPI. However, an examination of the items appearing towards the end of each subtest suggests that such marginal gains could have been achieved by the ability of a child to place colored toys in specified colored containers; to identify sources of reading material, boats, gasoline, and health care, and to extend descriptions of the roles of parents, teachers, policemen and dentists; to identify the ordinal position of each of a line of five checkers; or to appropriately color circles yellow, squares purple, and triangles orange.

Although appreciable differences existed between the means of total CPI scores of some criterion groups (where both parents were working, the means were 14.1 points higher on the pretest than for one parent working; income above \$7000 had means 12.2 points higher than those under \$5000; those 5 1/2 years of age and older had mean scores 8.6 points above those under 5 years) the effect of the program appeared to be to equalize achievement. In no cases did differences between adjusted total mean scores exceed 1.5 points. Investigation of possible program effects on group scores is evaluated as inconclusive.

The most positive statement to be attributed to the testing results may be that the Caldwell Preschool Inventory appears to discriminate between children who have experienced formal preschool programs and those who have not.

The general findings of inconclusive differences appeared consistent with findings reported on evaluations of similar exploratory programs in the United States (Krysowaty, 1972). Several generalizations may be inferred:

1. Children of preschool age (4 years 8 months to 6 years 4 months) are in a highly fluid stage of development, and both intellectual capacity (as measured by "intelligence" and verbal fluency test), and actual cognitive achievement are likely to undergo appreciable change under appropriately stimulative conditions.
2. While many children will meet or exceed achievement norms, some children who are initially below normal levels will gain slightly but not enough to reach standard levels.
3. The expectation of some proponents that formal preschool programs will be of considerable value in assuring that all children of preschool age will be ready to subsequently enter regular school programs at a standard level will not be met. In contrast, it may be inferred that a teacher-directed program which pressures the child to perform at intellectual levels appreciably above his observable capacity may be disadvantageous to later development. In this sense, "schooling" at too early an age may be harmful. Nevertheless, a child-selected program which would tolerate avoidance of each pressures may still provide appreciable educational value to the child.
4. This report does not provide conclusive evidence of the nature or value of such experiences, and the matter remains an area which may justify additional research.

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